Speed and Unit Rates Conversion Worksheet

Dimensional analysis with speed, flow rate and density: km/h, m/s, mph, knots, L/min, m^3/h and kg/m^3

Level: Ages 14–18 · Grades 9–12 · Years 10–13 (physics, chemistry, engineering)

allunitconversions.com/conversion-worksheets
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Name _____ Class _____ Date _____ Score / 20

Convert each rate. Write each conversion factor as a fraction so the units cancel, then calculate. Round answers to 2 decimal places where needed.

REFERENCE

1 km = 1000 m	**1 h = 60 min = 3600 s**	**1 mi = 1.609344 km**	**1 mph = 0.44704 m/s**
1 knot = 1.852 km/h	**1 ft = 0.3048 m**	**1 m^3 = 1000 L**	**1 US gal = 3.785411784 L**

All of these factors are exact. Shortcut: km/h ÷ 3.6 = m/s, because 1000 m ÷ 3600 s = 1/3.6.

WORKED EXAMPLE

72 km/h = ? m/s → 72 km/h × (1000 m / 1 km) × (1 h / 3600 s) = 20 → **20 m/s**

Part A: speed

1. 11 km/h = _____ m/s

2. 22.1 m/s = _____ km/h

3. 29 mph = _____ km/h

4. 125 km/h = _____ mph

5. 158 knots = _____ km/h

6. 402 km/h = _____ knots

7. 19 mph = _____ m/s

8. 5.7 m/s = _____ mph

9. 20 ft/s = _____ m/s

10. 1396 m/min = _____ km/h

Part B: flow rate and density

11. 4.1 L/min = _____ L/h

12. 2058 L/h = _____ L/min

13. 4.2 m^3/h = _____ L/min

14. 66 L/s = _____ m^3/h

15. 133 m^3/h = _____ L/s

16. 33 US gal/min = _____ L/min

17. 223 L/min = _____ US gal/min

18. 11.64 g/cm^3 = _____ kg/m^3

19. 4725 kg/m^3 = _____ g/cm^3

20. 24.4 g/L = _____ kg/m^3

Answers are rounded to 2 decimal places; answers that come out exact are shown without trailing zeros. Answer key on page 2. More worksheets and the matching charts: allunitconversions.com/conversion-worksheets

Answer key — Speed and Unit Rates Conversion Worksheet

For teachers · remove before handing out

#	Question	Answer	Working
PART A: SPEED			
1	11 km/h → m/s	**3.06 m/s**	11 km/h × (1000 m / 1 km) × (1 h / 3600 s) = 3.05555… ≈ 3.06
2	22.1 m/s → km/h	**79.56 km/h**	22.1 m/s × (3600 s / 1 h) × (1 km / 1000 m) = 79.56
3	29 mph → km/h	**46.67 km/h**	29 mph × (1.609344 km / 1 mi) = 46.67097… ≈ 46.67
4	125 km/h → mph	**77.67 mph**	125 km/h × (1 mi / 1.609344 km) = 77.67139… ≈ 77.67
5	158 knots → km/h	**292.62 km/h**	158 knots × (1.852 km/h / 1 knot) = 292.616… ≈ 292.62
6	402 km/h → knots	**217.06 knots**	402 km/h × (1 knot / 1.852 km/h) = 217.06263… ≈ 217.06
7	19 mph → m/s	**8.49 m/s**	19 mph × (0.44704 m/s / 1 mph) = 8.49376… ≈ 8.49
8	5.7 m/s → mph	**12.75 mph**	5.7 m/s × (1 mph / 0.44704 m/s) = 12.75053… ≈ 12.75
9	20 ft/s → m/s	**6.10 m/s**	20 ft/s × (0.3048 m / 1 ft) = 6.096… ≈ 6.10
10	1396 m/min → km/h	**83.76 km/h**	1396 m/min × (60 min / 1 h) × (1 km / 1000 m) = 83.76
PART B: FLOW RATE AND DENSITY			
11	4.1 L/min → L/h	**246 L/h**	4.1 L/min × (60 min / 1 h) = 246
12	2058 L/h → L/min	**34.3 L/min**	2058 L/h × (1 h / 60 min) = 34.3
13	4.2 m^3/h → L/min	**70 L/min**	4.2 m^3/h × (1000 L / 1 m^3) × (1 h / 60 min) = 70
14	66 L/s → m^3/h	**237.6 m^3/h**	66 L/s × (3600 s / 1 h) × (1 m^3 / 1000 L) = 237.6
15	133 m^3/h → L/s	**36.94 L/s**	133 m^3/h × (1000 L / 1 m^3) × (1 h / 3600 s) = 36.94444… ≈ 36.94
16	33 US gal/min → L/min	**124.92 L/min**	33 US gal/min × (3.785411784 L / 1 US gal) = 124.91858… ≈ 124.92
17	223 L/min → US gal/min	**58.91 US gal/min**	223 L/min × (1 US gal / 3.785411784 L) = 58.91036… ≈ 58.91
18	11.64 g/cm^3 → kg/m^3	**11,640 kg/m^3**	11.64 g/cm^3 × (1 kg / 1000 g) × (1,000,000 cm^3 / 1 m^3) = 11,640
19	4725 kg/m^3 → g/cm^3	**4.725 g/cm^3**	4725 kg/m^3 × (1000 g / 1 kg) × (1 m^3 / 1,000,000 cm^3) = 4.725
20	24.4 g/L → kg/m^3	**24.4 kg/m^3**	24.4 g/L × (1 kg / 1000 g) × (1000 L / 1 m^3) = 24.4

Teaching notes: common mistakes

- Converting only the top unit of a rate. km/h to m/s changes kilometres to metres and hours to seconds.
- Writing a factor upside down. Arrange each fraction so the unit you are removing cancels.
- Rounding between steps. Keep every digit until the final answer.

Answers are rounded to 2 decimal places; answers that come out exact are shown without trailing zeros. Every answer is calculated from the exact definitions and checked against the AllUnitConversions conversion engine before the PDF is produced. Matching reference chart: **allunitconversions.com/speed-conversion-chart**. Free to print, copy and share with attribution (CC BY 4.0).